REMARKS

The specification, claims, and drawings have been amended in response to the Examiner's objections and rejections herein under 35 U.S.C. §112 and 35 U.S.C. §103. Reconsideration of this application in view of these amendments and the following remarks is respectfully requested.

The Applicant hereby confirms the election of Group III claims 22-26 for further prosecution in this application. Non-elected claims 1-21 and 27-28 have been canceled without prejudice to Applicant's right to pursue such claims in continuing applications.

The Examiner has objected to Fig. 1 of the drawings for the positioning of lead line 18 and the use of flow direction indicators "a". An amended sheet of drawings addressed to these objections is being submitted with this amendment.

While lead line 18 in the revised version of Fig. 1 has been corrected, reconsideration of the objection to the flow direction indicators "a" in Fig. 1 is respectfully requested. A description of the feature relating to flow indicators "a" is clearly presented at page 5, lines 17-21 of the specification. The Applicant notes further that the explanation therein provided is similar to the explanations provided for other flow directional arrows in the drawings, which are also clear. The Applicant therefore respectfully reconsideration of this objection on the ground that the meaning of flow directional arrows "a" is clear from the disclosure as a whole, and therefore that the drawing as now amended is now in full compliance with CFR 1.84.

The Examiner additionally objected to the specification on the ground of certain informalities. The Applicant has addressed each of those informalities in the amendments to the specification hereinabove requested. Specifically, clarifying amendments as suggested by the Examiner have been made to the text at both of pages 6 and 7 of the specification. Accordingly, reconsideration and withdrawal of the objections to the specification are respectfully requested.

The Examiner has next rejected claims 22-24 and 26 of the application as unpatentable under 35 U.S.C. §103 over Ohta (U.S. Patent No. 6,086,832) in view of Lange (U.S. Patent No. 6,087,455). Ohta was cited to show a method for using a tank reactor with fixedly mounted catalyst, while Lange was cited to show a method of using a honeycomb substrate. This rejection is respectfully traversed for the following reasons.

The method of Ohta is a laboratory method for measuring the activity of a small catalyst sample in a laboratory apparatus consisting of a small recycle reactor (column 10, lines 1-7 of the patent). A catalyst sample is placed in a small basket in a sample chamber and reaction test mixtures are circulated past the sample under various conditions. The volumes of catalyst are small; i.e., they are to be kept under 300ml (column 8, lines 49-52). Further, the method of operation of the recycle apparatus is one of continuous flow through the system, (column 9, lines 28-32), this being required in order to avoid deterioration of the catalyst sample when reaction temperatures are reached (column 9, lines 13-17). The process of Ohta is thus neither anticipatory nor suggestive of a batch process such as is utilized in tank reactors on a commercial scale.

The Applicant finds no suggestion in Ohta that the apparatus and method therein described would have any utility whatever as a commercial batch reactor or process. The Examiner has suggested that it would be obvious to substitute the catalyst of Lange into the apparatus of Ohta, but clearly such a substitution would be obvious only for the purpose of providing an activity test of the Lange catalyst. In other words, the result of any such substitution would simply be a laboratory recycle testing reactor and testing process that would be nonanalogous to the Applicants batch processing method and reactor. In other words, the substitution would provide no reasonable assurance of success as to the Applicant's method or apparatus.

As to the Lange disclosure, the specification and especially the examples of the Lange patent indicate that the commercial batch processes involved is one based on a "moving catalyst" reactor design wherein the catalyst is mounted on an agitator within the reactor tank (column 7, lines 43-44 of the patent, and Examples 1-5 at columns 7 and 8 of the patent ). The Applicant has acknowledged the prior use of such designs and noted the various disadvantages thereof. Clearly, Lange omits any enabling description of a reactor design wherein a fixed bed honeycomb catalyst could be effectively employed.

Most importantly, the results obtained in the Applicant's loop reactors are unexpectedly superior to those suggested by either or both of Lange and Ohta. Lange utilizes macroporous catalysts to overcome problems such as residue retention (column 1, lines 21-35) and polymer degradation from non-selective hydrogenation (column 1, lines 36-51 and column 2, lines 3-6 of the patent). There

is no suggestion of the energy efficiency mass transfer improvements attending the use of monolith loop reactors in accordance with the invention.

These unexpected advantages of the invention are disclosed by the Applicant at page 6, lines 14-20 of the application, as follows:

> "The blade agitator not only provides for the circulating flow of the liquid within the reactor, but also serves to disperse liquid phases when more than one liquid phase is present. Also, the required mechanical energy is comparable, if not better than that required for standard stirred tank reactors, since the pressure drop of the monolith is relatively low and the liquid/catalyst interface is improved due to the defined catalytically charged flow paths for the liquid. Accordingly energy losses due to ineffective dissipation are minimized. "

and further, at page 13, lines 15-22 of the application:

> "The higher efficiency and improved mass transfer performance of the monolith loop reactors over the competitive designs characterized in Fig. 11 are evident. Thus, over most of the useful range of input power, monolith loop reactors provide significantly higher mass transfer rates at lower energy inputs than any of the other designs provide. And, these advantages are secured even in operating modes where the power input to the monolith reactor is provided by bubble agitation alone, the latter modes being particularly advantageous since no mechanical systems for the input of stirring or other mechanical agitation are required."

In light of the foregoing remarks, it is respectfully submitted that the process defined by claims 22-24 and 26 of this application is clearly patentable over the combination of Ohta and Lange, and should be allowed. Accordingly, reconsideration and withdrawal of the rejection of those claims under 35 U.S.C. §103 are respectfully requested.

The Examiner next rejected claim 25 of the application as unpatentable over Ohta and Lange further in view of Blanchet et al. (U.S. Patent No. 5,804,147). Blanchet was cited to show a catalyst honeycomb in a reactor incorporating a by-pass passageway, the Examiner concluding that the use of such a catalyst in the method of Ohta would have been obvious.

Reconsideration of this rejection is respectfully requested for the reason that the by-pass passageway in Blanchet is not provided for the purpose of facilitating the recirculation of a reactant in a tank or loop reactor as disclosed by either of Ohta or the Applicant. The reactor of Blanchet is a one-pass reactor for treating an exhaust gas. Thus the operating modes of the passageway are limited to (i) a closed mode which forces the exhaust gas through honeycomb 20, and (ii) an open mode wherein

the exhaust gas completely bypasses honeycomb 20 to exit the reactor via honeycomb 42. Thus the passageway is not a recirculating passageway as required by the Applicant, and it has no obvious utility or advantage in the method of Ohta.

For the above reasons, the Applicant respectfully submits that claim 25 of the application is patentable over the combination of Ohta, Lange and Blanchet, and therefore that reconsideration and withdrawal of the rejection of claim 25 under 35 U.S.C. §103 should be withdrawn.

Finally, the Applicant additionally submits new claims 29 and 30 in this application for consideration by the Examiner. Those claims are drawn to a particularly preferred embodiment of the invention that, in the Applicant's view, is also patentable over the disclosures of the cited references.

The particular embodiment to which these claims are directed is one in which both gas and mechanical means are employ in combination to control recirculation through the catalyst in the reactor. The ratio of gas to liquid in the catalyst can therefore be controlled by controlling the extend of gas flow and mechanical stirring, with improved results not even remotely suggested by the cited references.

For a better understanding of the unexpected advantages of this embodiment, reference is made to the Applicant's disclosure at page 9, lines 17-30 of the specification:

> "The reactor embodiment shown in Fig. 8 is similar to that of Fig. 3, except that both a mechanical flow agitator 24 and a disk-shaped bubble flow agitator 42 are provided within the reactor vessel. The recirculating flowpath of the reactant liquid indicated by arrows f is analogous to that shown in Fig 3. However, in the case of the Fig. 8 reactor, liquid flow is controlled not only by the gas feed from agitator header 42, producing upwardly moving bubbles in honeycomb channels 18, but also by mechanical agitator 24. Thus agitator 24 can add to or reduce the flow of liquid into channels 18 resulting from gas bubble lift alone. "

Further, at page 11, lines 26 to page 12, line 3 of the specification, the Applicant notes the following:

> "Evident from a study of Fig. 10 are the wider ranges of liquid and gas linear velocity observed within the reactor, these being the result of the new degree of freedom available through the application of the additional mechanical liquid driving force. This added force permits reactor operation over a much wider range of variation in the ratio of gas to liquid flow in the monolith. For example, high liquid flow velocities can be achieved at zero or low gas flow velocities, an operating mode that substantially increases the recirculation number for the reactor. This brings conditions within the reactor closer to those of an ideally mixed system. Another significant advantage of the higher recirculation number is an increase in the heat exchange efficiency of the reactor, where such is useful for process control."

Again, the Applicant submits that neither the substance of these preferred methods nor the advantages attending their use are taught or suggested by Ohta, Lange, Blanchet, or any combination thereof. Accordingly, favorable consideration and allowance of these claims are respectfully requested.

For all of the above reasons, the Applicant submits that remaining claims 22-26 and 29-30 of this application fully meet the requirements of 35 U.S.C. §112 and 35 U.S.C. §103 should be allowed. Therefore, reconsideration of this application and allowance of all remaining claims as amended are courteously solicited.

Respectfully submitted,

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Page 6, last full paragraph:

--The monolithic loop reactor embodiments 40 shown in Figs. 3, 4, 5 and 6 are adapted for a three-phase or solid catalyzed gas/liquid reaction, and have a recirculating gas feed system with a control valve 38. It will be noted that the position of the honeycomb monolithic substrate 12 of Fig. 3 is similar to that of Fig. 1, whereas the position of the honeycomb monolithic substrate 32 of Figs. 4, 5 and 6, is similar to that of Fig. 2. However, the internal flow agitator utilized in the embodiments of Figs. 3 and 4 is in the form of a gas header or sparger. In Fig. 3, the header or sparger 42 is in the form of a disk positioned within container 14 below monolith or monolithic substrate 12, whereas in Fig. 4, the header or sparger 44 is in the form of a ring or annulus and positioned within container 34 below monolith or monolithic substrate32.--

Page 7, first full paragraph:

--It will be noted that the separation of the gas bubbles 46 from the liquid occurs in the top cover area or cover portion 15 of the reactors 40. The gas from headers 42, 44 may be recycled and forced back, together with fresh gas, into the reactors through the gas supply system. The gas/liquid separation from the product liquid is easily accomplished at the bottom of the reactor, where no gas bubbles are present, and no additional moving parts are required. If more flow is desired through the monoliths, a blade agitator may be added in a manner similar to the embodiments of Figs. 1 and 2.--

IN THE CLAIMS

-- 22. A method of producing a product from a reactant within a recirculating tank reactor which comprises,

feeding a reactant into a tank reactor,

fixedly positioning a monolithic honeycomb substrate having catalytic surfaces within said tank reactor so as to leave room therein for at least one adjacent bypass passageway,

initiating internal agitation within the tank reactor to initiate ~~internally activating~~ a flow of said reactant within said tank reactor,

recirculating such ~~activated~~ flow of reactant through said fixedly positioned catalyzed honeycomb substrate and through said adjacent bypass passageway, and

removing a product from said tank reactor.

23. A method in accordance with claim 22 wherein mechanical internal agitation is used to recirculate the flow of reactant ~~including the step of internally mechanically activating the flow~~ within the bypass passageway.

24. A method in accordance with claim 22 wherein the reactant is provided in a liquid medium, and wherein the step of ~~internally activating~~ recirculating the flow of reactant comprises forcing gas into ~~designated portions of~~ the liquid medium and forming upwardly flowing bubbles in ~~such portions~~the liquid medium.

25. A method in accordance with claim 22 ~~including~~ wherein the step of fixedly positioning the monolithic honeycomb substrate within the tank reactor comprises fixedly positioning the honeycomb substrate adjacent inner sidewall portions of the tank reactor~~, and forming the adjacent bypass passage centrally of the honeycomb substrate~~.

26. A method in accordance with claim 22 wherein ~~including~~ the step of fixedly positioning the monolithic honeycomb substrate within the tank reactor comprises fixedly positioning the honeycomb substrate centrally within the tank reactor~~, and forming the adjacent bypass passageway between the centrally positioned honeycomb substrate and inner wall portions of the tank reactor~~. --